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A STUDY OF THE LESIONS PRODUCED BY BACILLUS PROTEUS.*

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The proteus group of microorganisms has interested bacteriologists since the publication of Hauser's work on this family. Altho Hauser and others have described various strains belonging to this group of microorganisms, there seems to be little or no unanimity of opinion with reference to the biological characters by which the various strains may be recognized and differentiated.

The question as to the pathogenic rôle which the proteus bacilli play in human and veterinary pathology is still unsettled. Metchnikoff believes *B. proteus* to be the cause of infantile diarrhea. C. O. Jensen found it to be the cause of a form of diarrhea of calves. Meat poisoning, Weil's disease, peritonitis, and pleurisy have all been ascribed to this group of microorganisms.

We became interested in *B. proteus* in March, 1912, when the organism was repeatedly isolated in pure culture from the wound of a patient at the University Hospital, who had undergone nephrectomy because of tuberculosis of the kidney. The organism proved to be pathogenic for rabbits and rats even when injected in very small doses. Since then we have isolated *B. proteus* in pure culture in two other cases of human infection in which it was found to be highly pathogenic for rabbits.

The experimental lesions produced by *B. proteus* vary widely in character since they depend upon the virulence of the particular culture employed. Very virulent cultures introduced into the peritoneal cavity of rabbits, rats, or guinea-pigs produce death within a few hours, evidently because of the intense toxemia. In these cases there is a little increase of fluid in the peritoneal cavity and some congestion of the peritoneal surfaces.

When less virulent cultures are inoculated intraperitoneally or subcutaneously, the animal undergoes rapid and extreme emacia-

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tion. Death usually occurs within one week from the intraperitoneal inoculation, and somewhat later from subcutaneous inoculation. The peritoneal surfaces show a number of whitish nodules of varying size. Histologically, the nodules in these acute cases consist almost entirely of polymorphonuclear leukocytes associated with large numbers of bacteria. Frequently the center of the nodule undergoes liquefactive necrosis. From the subcutaneous inoculation a single abscess develops, gradually increasing in size until death occurs.

When cultures of low virulence are injected intraperitoneally, numerous firm, whitish nodules develop on the peritoneal surfaces within a few days. The animals often undergo a progressive loss of weight which terminates in death or in ultimate recovery. In the milder infections there may be no loss of weight. Histologically, the nodules show a chronic type of inflammation largely proliferative in character. It is a granuloma. A large number of connective tissue cells rich in cytoplasm (epithelioid cells) appear. Many multinucleated cells are often seen, but no giant cells of the Langhans type have been found in the experimental lesions. A varying number of large and small mononuclear leukocytes occurs. Some polymorphonuclear leukocytes may be present. There is often a central necrotic mass surrounded by the epithelioid cells and leukocytes. Sometimes the resemblance to a typical tubercle is close.

One of the clinical cases referred to above was a rather severe infection of a finger. Pieces of excised tissue showed typical tubercles. A proteus virulent for rabbits was recovered in pure culture from the lesion. Altho no acidfast bacilli were demonstrated, it is probable that tuberculosis was a complicating infection in this case.

In a general way it may be said that virulent cultures of *B. proteus* produce typical abscesses, and that cultures of moderate virulence produce proliferative lesions which may be classed with the granulomata. Extreme emaciation is one of the characteristic results of severe proteus infection in rabbits.

A detailed account of our experiments will be published later